

## NIEHS Investigates Arctic Health Issues

In 1991, the eight nations that make up the North Polar region (Canada, Denmark, Finland, Iceland, Norway, Sweden, Russia, and the United States) created the Arctic Monitoring and Assessment Programme (AMAP) to characterize the levels and effects of environmental contamination in the Arctic. One result of that program was *Arctic Pollution Issues: A State of the Arctic Environment Report* and a companion document, *The AMAP Assessment Report: Arctic Pollution Issues*, both issued in 1997, which detailed the unique environmental and health problems facing the Arctic's ecology and populations [see *EHP* 106:A64–A69 (1998)]. This past May, health and environmental officials, research scientists, medical providers, leaders of indigenous communities, and concerned Arctic citizens met in Anchorage, Alaska, to explore these issues at the International Conference on Arctic Development, Pollution, and Biomarkers of Human Health.

At the meeting, organized by the NIEHS and the Alaska Area Native Health Service, Andrew Gilman, director of Health Canada's Office of Sustainable Development, noted that although the AMAP reports described relatively low levels of hazardous substances in the Arctic air, water, and food web compared to other geographic areas, those levels cannot be dismissed as insignificant because of the reliance of indigenous peoples throughout the Arctic on a diet of fish and marine and terrestrial mammals, which ingest and bioaccumulate environmental contaminants such as persistent organic compounds and heavy metals. Addressing conference participants, Gilman said, "The relationship between indigenous people in the Arctic and their food is entirely different from your relationship with a Big Mac." Representatives of indigenous peoples at the conference explained that hunting and fishing and the preparation and consumption of the typical subsistence diet in the Arctic not only meets nutritional needs but is a fundamental component of the peoples' spiritual and cultural life. Thus, environmental threats to the food web are of deep concern, particularly since the isolation of the Arctic area means that indigenous groups have no acceptable alternative to subsistence fishing and hunting. Both Gilman and Arctic residents challenged the environmental health scientists present to develop the tools needed to monitor exposures and effects from environmental contamination in the Arctic.



**A natural connection.** A recent conference highlighted the need for biomarkers of exposure to contaminants in the subsistence diets of indigenous Arctic peoples.

This is a difficult challenge. Much of the contamination in the region actually originates in the lower latitudes and is deposited by winds sweeping up over the North Pole. Also, the Arctic human population is small, culturally diverse, and distributed across a vast, harsh geographic area, making it difficult to conduct disease surveillance and monitoring, provide public health prevention services, and deliver health care.

Much of the Arctic conference focused on biomarkers under development to measure exposures to pollutants, their effects, and variations in people's susceptibility to such effects. Biomarkers have unlimited potential to clarify the interactions between pollution, ecological systems, and human health in the Arctic environment, says William Suk, director of the Chemical Exposures and Molecular Biology Branch at the NIEHS. For example, many of the emerging assays discussed in Anchorage are intended to identify low levels of exposure to environmental contaminants in animal species or humans and to detect subtle, subclinical biochemical precursors of human disease or dysfunction. Tony Knap, director of the Bermuda Biological Station for Research, says that the value of biomarkers is that they may offer the technology needed to monitor contamination of the physical, ecological, and human Arctic environments, and may provide Arctic residents and policy makers with data needed to intervene before potential problems progress to pollution crises.

However, the biomarkers discussed at the meeting are currently under development

and none are ready for application. Furthermore, when such biomarkers are considered for use in the Arctic, they present ethical and public health questions that must be considered by researchers and the people who might be tested for them. For instance, ethical concerns include how information obtained through the use of biomarkers that identify individual heightened genetic susceptibility to adverse effects of Arctic contamination could be used by prospective employers or insurance providers, and what the effects of this kind of information on the emotional health of the people tested might be. Challenges from a public health standpoint include the logistics of monitoring remote Arctic populations, complying with regulations in the eight different Arctic countries, and interpreting test results when it is unlikely that background levels or matched control groups with similar exposure routes exist.

Suk notes that research scientists from various disciplines rarely meet with the potential beneficiaries of the application of their studies, so meetings such as this are a step in the right direction because they place research questions in a human context, accentuate the need for better tools to monitor exposures and effects, and may prompt more consideration of the end applications of biomarker research into the AMAP health effort. The NIEHS is expected to provide the AMAP Human Health Assessment Group with a report and recommendations from the Anchorage conference by the end of the summer.

—Dan C. VanderMeer